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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/666,052	09/17/2003	William H. Pettit	8540G-000108	6585

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EXAMINER	
KALAFUT, STEPHEN J	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 07/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/666,052	PETTIT ET AL.	
	Examiner	Art Unit	
	Stephen J. Kalafut	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *19 Dec 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This claim is drawn to the "method of claim 1", but claim 1 recites a "fuel processing system", which is not a method but a device.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 9, 10, 22, 23 and 29 are rejected either under 35 U.S.C. 102(b), or under 35 U.S.C. 102(a) and (e) as being anticipated by Dybkjær (US 6,224,789).

Dybkjær discloses a fuel processing system that includes an autothermal reformer (ATR), and a steam reformer (HTCR), respectively corresponding to the present "first" and "second" reactors. Claims 2 and 3 are understood as reciting the autothermal reformer to be a type of partial oxidation reformer, because partial oxidation reforming would occur within the ATR. Thus, the ATR of Dybkjær would meet both these terms in the two respective claims. The two outputs (8, 9) of the reformers are combined to provide a reformate flow (10), which contains

hydrogen (column 2, lines 61-64). Because the two reformers operate with different reactions, their pressures would inherently be different. The output of the ATR is used to heat the HTCR (column 2, lines 20-25). Because the two reformers are the same as those claimed, the response time relationship would also inherently accrue. Because no fuel cell is required to be present, the relationship to fuel cell demand, in claim 10, is not given patentable weight. Because the present application is a continuation-in-part of Serial No. 10/044,335, some of the present subject matter would be entitled to its filing date. If so, Dybkjær is issued less than a year before that filing date, and would be available under subsections (a) and (e) of §102. If not, Dybkjær is available under subsection (b).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær.

Dybkjær does not state that the autothermal reformer operates at a lower pressure than the steam reformer. However, the skilled artisan would be familiar with the effect of pressure on the product yield and efficiency of the reactors. For this reason, determining an optimal pressure for both would be within the skill thereof. This claim would thus be obvious over Dybkjær.

Claims 6, 8, 11-19, 21, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær in view of Yamaoka *et al.* (US 6,630,109).

Dybkjær does not disclose the vaporization of fuel entering the steam reformer, the a catalytic oxidizer that preheats a reactor, or a fuel cell stack with its own an oxidant supply, which produces electricity from the combined reformate and the oxidant. Yamaoka *et al.* disclose a fuel cell (1) that may include plural cells therein (column 9, lines 4-10), thus forming a stack. The fuel cell has its own oxidant supply (17), and produces electricity from the oxidant and hydrogen from a reformer (4). Because this is the same gas produced by Dybkjær, it would be obvious to use the reformate gas of Dybkjær to provide hydrogen to the fuel cell of Yamaoka *et al.* Yamaoka *et al.* also disclose a preferential oxidizer (5) downstream from a reformer, which would oxidize the CO within the reformate to the less poisonous gas CO_2. Since the oxidation reaction is exothermic, the oxidizer would heat itself, and thus heat "a reactor". To remove harmful CO from the reformate of Dybkjær, it would be obvious to use the preferential oxidizer of Yamaoka *et al.* downstream therefrom. Yamaoka *et al.* also disclose a vaporizer (7) for liquid fuel. Because a vaporizer would enable a reformer to operate with liquid raw fuels, and because the output of the ATR of Dybkjær contains usable heat, it would be obvious to use the heat output of the ATR of Dybkjær to preheat liquid raw fuel, as shown by Yamaoka *et al.*, whose reformer includes both steam reforming (column 8, line 41) and partial oxidation (column 8, line 53) reactions. The ATR of Dybkjær would also be capable of operating either as an autothermal reformer (where both the above reactions occur) or an a partial oxidation reformer.

Claims 7 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær in view of Singh *et al.* (US 5,523,483).

These claims differ from Dybkjær by reciting the preheating of incoming oxidant with heat from at least one of the two reformer outputs. Singh *et al.* discloses an oxidant stream (28) that is preheated (32) in order to be used in an autothermal reformer (36). Because this prepares the gas to be used in this reactor, and because the output of the ATR of Dybkjær contains usable heat, it would be obvious to use the heat output of the ATR of Dybkjær to preheat the incoming oxidant, as taught by Singh *et al.*

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær in view of Matsubayashi *et al.* (US 6,103,411).

This claim differs from Dybkjær by reciting a combustor in thermal contact with the output of the first reformer, and which provides heat to the second reformer. The combustor reacts an oxidant flow and a fuel flow. Matsubayashi *et al.* disclose a combustor (42) that heats a reformer (41), by reacting an oxidant flow (112) and a fuel flow (108). Because the combustor would consume unused fuel and because the steam reformer of Dybkjær requires heat input, it would be obvious to use a combustor as shown by Matsubayashi *et al.* to heat the steam reformer of Dybkjær.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær in view of Yamaoka *et al.* as applied to claim 11 above, and further in view of Singh *et al.*

The pertinent points of the three references are all stated above. It would be obvious to preheat the oxidant entering the ATR of Dybkjær as shown by Singh *et al.*, and use the reforming system of Dybkjær with a fuel cell as disclosed by Yamaoka *et al.*

Claims 30-48, 50 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær in view of Yamaoka *et al.* as applied to claims 6, 8, 11-19, 21, 26 and 28 above, and further in view of Echigo *et al.* (JP 2000-285,948).

These claims differ from the above combination by reciting the determining of a target H_2 production rate, and adjusting the reformate production rate in at least one of the two reformers to achieve the target rate. Echigo *et al.* discloses a system of plural fuel reforming systems (200), each with its own reformer (3), used to provide hydrogen to a fuel cell (1). A controller (6) detects the load demanded from the fuel cell, which would correspond to a target amount of hydrogen, and accordingly adjusts the operation of the reforming systems (section 0014). This would involve adjusting the rates of hydrogen production. Echigo *et al.* also disclose a "CO transformer" (4), which would be a shift converter, and a "CO clearance machine" (5), which is a selective oxidizer (section 0008). Because the fuel cells of Yamaoka *et al.* would experience transient load demands, it would be obvious to control the operation of the fuel cell system of Yamaoka *et al.* and plural reformers of Dybkjær with the control equipment of Echigo *et al.* Balancing the outputs of the two reformers according to heat requirements and the reactant amounts would be within the skill of the ordinary chemical engineer. Devices that adsorb H_2O and CO, to remove them from the reformate, are known in the art, as admitted by applicants.

Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dybkjær in view of Yamaoka *et al.* and Echigo *et al.* as applied to claim 30 above, and in view of Singh *et al.*

The pertinent points of the four references are all stated above. It would be obvious to preheat the oxidant entering the ATR of Dybkjær as shown by Singh *et al.*, and use the reforming system of Dybkjær with a fuel cell as disclosed by Yamaoka *et al.* and control system of Echigo *et al.*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Skala *et al.* (US 2003/0134166) is the parent of the present application. Funk *et al.* (US 4,485,070) discloses an ammonia production system that includes two reformers and a shift converter disposed in series. Ogino *et al.* (JP 2003-034504) disclose an autothermal reformer with a vaporizer for incoming raw fuel.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen J. Kalafut whose telephone number is 571-272-1286. The examiner can normally be reached on Mon-Fri 8:00 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

sjk

STEPHEN KALAFUT
PRIMARY EXAMINER
GROUP 1700